IN THE CLAIMS:

What is claimed:

1. An apparatus for modeling a process, said process having one or more disturbance variables as process input conditions, one or more corresponding manipulated variables as process control conditions, and one or more corresponding controlled variables as process output conditions, said apparatus comprising:

a data derived primary analyzer adapted to sample an input vector spanning one or more of said disturbance variables and manipulated variables, said data derived primary analyzer generating an output based on said input vector;

an error correction analyzer adapted to sample said input vector, said error correction analyzer estimating a residual between said data derived primary analyzer output and said controlled variables; and

an adder coupled to the output of said data derived primary analyzer and said error correction analyzer, said adder summing the output of said primary and error correction analyzers to estimate said controlled variables.

2. The apparatus of claim 1, wherein said data derived primary analyzer and said error correction analyzer sample said input vector continuously.

3. The apparatus of claim 1, wherein said data derived primary analyzer and said error correction analyzer sample said input vector using predetermined delay periods.

4. The apparatus of claim 3, wherein said delay period is determined using an adaptive process.

5. The apparatus of claim 3, wherein said delay period is user selectable.

6. The apparatus of claim 1, wherein said data derived primary analyzer further comprises:

a derivative calculator for computing a derivative of the output of said primary analyzer; and

an integrator coupled to the output of said derivative calculator for generating a predicted value.

7. The apparatus of claim 1, wherein said disturbance and manipulated variables are latent variables.

8. The apparatus of claim 1, wherein said data derived primary analyzer is a linear model.

9. The apparatus of claim 8, wherein said linear model is a Partial Least Squares (PLS) model.

10. The apparatus of claim 9, further comprising a filter coupled to the output of said data derived primary analyzer, said filter receiving said output vector and providing a filtered vector as an output.

11. The apparatus of claim 10, wherein said filter is adaptive.

12. The apparatus of claim 10, wherein said filter is a Kalman filter adapted to receive said controlled variables.

13. The apparatus of claim 9, wherein said PLS model further comprises a spline generator for mapping said input vector to said primary analyzer output.

14. The apparatus of claim 9, wherein said error correction analyzer is a neural network.

15. The apparatus of claim 14, wherein said neural network further comprises:

a derivative calculator for computing a derivative of the output of said primary analyzer; and

an integrator coupled to the output of said derivative calculator for generating a predicted value suitable for correcting the output of said data derived primary analyzer.

16. The apparatus of claim 14, further comprising a filter coupled to the input of said data derived primary analyzer, said filter receiving said input vector and providing a filtered vector for capturing the dynamics of the process to the input of said neural network.

17. The apparatus of claim 9, wherein said error correction analyzer is a neural network partial least squares model.

18. The apparatus of claim 1, further comprising:

a distributed control system coupled to the output of said adder; and

a run-time delay and variable selector coupled to the output of said distributed control system, said run-time delay and variable selector generating said input vector.

19. The apparatus of claim 18, wherein said run-time delay and variable selector are adapted to receive delay and variable settings, wherein said data derived primary analyzer and said error correction analyzer are adapted to receive model parameters, said apparatus further comprising:

a data repository for storing historical values of said disturbance variables, said manipulated variables and said controlled variables;

a development delay and variable selector coupled to said data repository for selecting and time-shifting one or more of said disturbance variables, said manipulated variables and said controlled variables, said development delay and

variable selector generating said delay and variable settings;

a hybrid development analyzer coupled to said development delay and variable selector, said hybrid development analyzer generating said model parameters.

20. The apparatus of claim 18, wherein said hybrid development analyzer further comprises:

a development primary analyzer coupled to said data repository, said development primary analyzer adapted to sample a development input vector spanning one or more of said disturbance variables and manipulated variables, said development primary analyzer adapted to sample one or more controlled variables, said development primary analyzer generating an output based on said input vector;

a subtractor coupled to said data repository and to said development primary analyzer, said subtractor adapted to receive one or more controlled variables from said data repository, said subtractor generating a primary model error output;

a development error correction analyzer coupled to said data repository and said development primary analyzer error output, said development error correction analyzer adapted to sample said development input vector, said development error correction analyzer estimating a residual between said development primary analyzer output and said controlled variables; and

an adder coupled to the output of said development primary analyzer and said development error correction analyzer, said adder summing the output of said primary and error correction analyzers to estimate said controlled variables.

21. A method for modeling a process having one or more disturbance variables as process input conditions, one or more corresponding manipulated variables as process control conditions, and one or more corresponding controlled variables as process output conditions, said method comprising the steps of:

(a) picking one or more selected variables from said disturbance variables and said manipulated variables;

(b) providing said selected variables to a data derived primary analyzer and an error correction analyzer;

(c) generating a primary output from said selected variables using said data derived primary analyzer;

(d) generating a predicted error output from said selected variables using said error correction analyzer; and

(e) summing the output of said primary and error correction analyzers.

22. The process of claim 21, wherein step (c) further comprises the step of applying a linear model in the data derived primary analyzer.

23. The process of claim 21, wherein said applying a linear model step further comprises the step of applying a Partial Least Squares (PLS) model to generate said primary output.

24. The process of claim 21, wherein said applying a non-linear model step further comprises step of applying a non-linear model in the error correction analyzer.

25. The process of claim 21, wherein step (d) further comprises the step of applying a neural network to generate said predicted error output.

26. The process of claim 25, wherein said neural network applying step further comprises the steps of:

computing a derivative of said primary output;

integrating said derivative; and

correcting said primary output.

27. The process of claim 21, further comprising the steps of:

presenting said summed output to a distributed control system;

selecting and time-shifting pre-determining variables from said distributed control system using a run-time delay and variable selector; and

presenting the output of said run-time delay and variable selector to said data derived primary analyzer and said error correction analyzer.

28. The method of claim 27, wherein said run-time delay and variable selector is adapted to receive delay and variable settings, wherein said data derived

primary analyzer and said error correction analyzer are adapted to receive model parameters, said method further comprising the steps of:

(a) picking one or more training variables from disturbance variables and manipulated variables stored in said data repository, said training variables having a corresponding training controlled variable;

(b) determining said delay and variable settings from said training variables;

(c) providing said training variables to a training primary analyzer and a training error correction analyzer;

(d) generating a training primary output from said training variables using said training primary analyzer;

(e) subtracting said training primary output from said training controlled variable to generate a feedback variable;

(f) generating a predicted training error output from said training variables and said feedback variable using said training error correction analyzer;

(g) summing said training primary output and said predicted training error output;

(h) updating said delay and variable settings and said model parameters;

(i) computing a difference between said summed output of step (g) and said training controlled variable;

(j) repeating steps (b)-(i) until said the performance of said analyzer on a test data set reaches an optimum point;

(k) storing said delay and variable settings in said run-time delay and variable selector; and

(l) storing said model parameters in said data derived primary analyzer and said error correction analyzer.

29. The process of claim 28, wherein said training input vector is defined as $X = \sum_{h=1}^{r} t_h p_h' + E = TP' + E$, wherein said training primary output is defined as $Y = \sum_{h=1}^{r} u_h q_h' + F = UQ' + F$, wherein Y further equals TBQ' + F, said training primary analyzer generating a regression model between T and U, wherein step (d) further comprises the step of minimizing $\|F\|$.

30. The process of claim 29, wherein said generating a primary output step further comprising the steps of:

generating $t_h = E_{h-1} w_h$;

generating $E_h = E_{h-1} - t_h p'_h$; and

generating the primary output $Y = \sum b_h t_h q'_h$.

31. The process of claim 28, wherein step (f) further comprises the steps of training a neural network partial least squares error correction analyzer.

32. The process of claim 31, wherein said neural network partial least squares error correction analyzer has a non-linear function $f(t_h)$ and an error function, wherein said training input vector is defined as $X = \sum_{h=1}^{r} t_h p_h' + E = TP' + E$, wherein said

training primary output is defined as $Y = \sum_{h=1}^{r} u_h q_h' + F = UQ' + F$, wherein Y further equals TBQ' + F, further comprising the step of minimizing said error function $\|u_h - f(t_h)\|^2$ in said neural network partial least squares error correction analyzer.

33. A program storage device having a computer readable program code embodied therein for modeling a process, said process having one or more disturbance variables as process input conditions, one or more corresponding manipulated variables as process control conditions, and one or more corresponding controlled variables as process output conditions, said program storage device comprising:

a data derived primary analyzing code adapted to sample an input vector spanning one or more of said disturbance variables and manipulated variables, said data derived primary analyzing code generating an output based on said input vector;

an error correction analyzing code adapted to sample said input vector, said error correction analyzing code estimating a residual between said data derived primary analyzing code output and said controlled variables; and

an adder code coupled to the output of said data derived primary analyzing code and said error correction analyzing code, said adder code summing the output of said primary and error correction analyzing code to estimate said controlled variables.

34. The program storage device of claim 33, wherein said computer readable program code embodied therein models a chemical process.

35. The program storage device of claim 33, wherein said computer readable program code embodied therein models an oil refining process.

36. The program storage device of claim 33, wherein said computer readable program code embodied therein models a manufacturing process.

37. The program storage device of claim 33, wherein said computer readable program code embodied therein models a target marketing process.

38. The program storage device of claim 33, wherein said computer readable program code embodied therein models a financial planning process.

39. The program storage device of claim 33, wherein said computer readable program code embodied therein models a signal processing process.